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Assessing the Effects of Individual Augmentation (IA) on Active Component Navy Enlisted and Officer Retention

by

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and
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13. ABSTRACT (maximum 200 words)

  This report summarizes the results of an analysis of whether individual augmentation (IA) deployment affects retention rates for Navy enlisted personnel and junior officers. The analysis compared retention rates between those personnel who have been deployed via IA to equivalent cohorts of Navy personnel who have not been on an IA deployment. Retention rates were compared in three different ways: aggregate comparisons, comparisons by individual demographic categories, and comparisons based on standard statistical modeling techniques (logistic regression), in order to simultaneously control for all the demographic and other observable characteristics.

  Overall, the analysis found little evidence that IA deployment is hurting retention rates among those who have experienced one or more IA deployments. In fact, in almost all of the comparisons, the retention rates of those who have had one or more IA deployments were higher than the retention rates of their Navy colleagues who have only been on conventional Navy deployments. The only categories where lower retention rates were definitively identified were for E-3s and E-4s, though the decrease in retention rates was only about one percent.

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EXECUTIVE SUMMARY

This report summarizes our analysis of whether individual augmentation (IA) deployment is affecting retention rates for Navy enlisted personnel and junior officers. Our analytical approach was to compare retention rates between those personnel who have been deployed via IA to equivalent cohorts of Navy personnel who have not been on an IA deployment. "Equivalent" means matching by (or controlling for in multivariate models) observable characteristics such as deployment experience, rank/pay grade, warfare specialty/rating, Armed Forces Qualifying Test (AFQT) for enlisted personnel, family status, gender, and race/ethnicity.

We compared retention rates in three different ways: aggregate comparisons, comparisons by individual demographic categories, and comparisons based on standard statistical modeling techniques (logistic regression), in order to simultaneously control for all the demographic and other observable characteristics. In this report, we present detailed results for enlisted personnel and summarize the results for junior officers. Additional analyses for junior officers were conducted by our thesis student, Lieutenant Michael Paisant, USN, and those results are documented in Paisant (2008).

Our data consisted of a list of those active component Navy personnel deployed via IA since March 2002 and monthly administrative records for all active component Navy personnel from October 1997 through September 2007. The former was provided by Pers-4 and contained, among other information, the name, rank/pay grade, SSN, and date deployed of each individual. The latter was compiled from extracts of the *Proxy Perstempo* file maintained by the Defense Manpower Data Center (DMDC) containing monthly information on all active component personnel in the Navy, including name, rank/pay grade, social security number (SSN), designator/rating, gender, race/ethnicity, AFQT scores (for enlisted personnel), expiration of term of service (ETS), and a DMDC-derived measure of deployment experience.

WHAT DID WE FIND OUT?

Overall, we found little evidence that IA deployment is hurting retention rates among those who have experienced one or more IA deployments. In fact, in almost all of our comparisons, the retention rates of those who have had one or more IA deployments ("IAers") were *higher* than the retention rates of their Navy colleagues who have only been on conventional Navy deployments ("non-IAers"). See Figures 1 and 2 for aggregate comparison results.
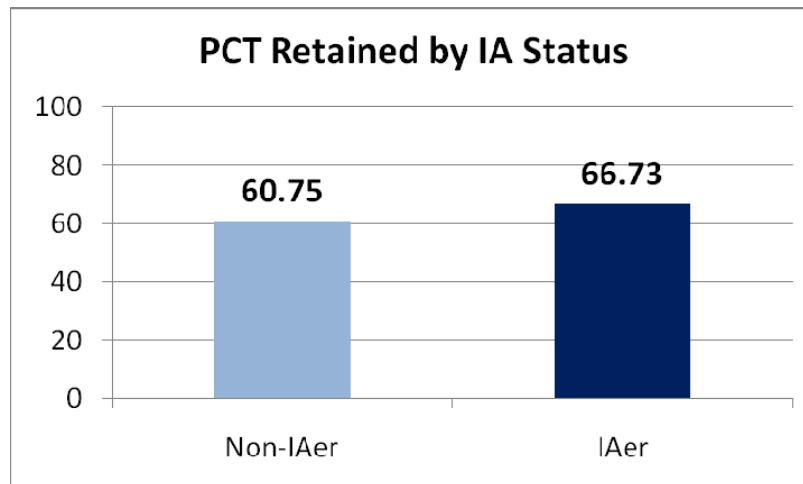
Figure 1.   Percent of non-IAer and IAer enlisted personnel retained.
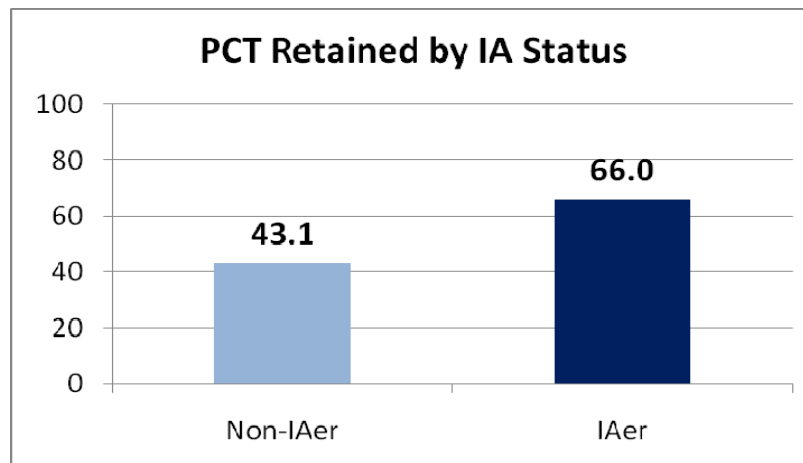
Figure 2.   Percent of non-IAer and IAer junior officers retained.

The only categories where we found lower retention rates for IAers compared to non-IAers were for E-3s and E-4s and, in these cases, the decrease in retention rates was only about one percent (see Figure 3).[1]
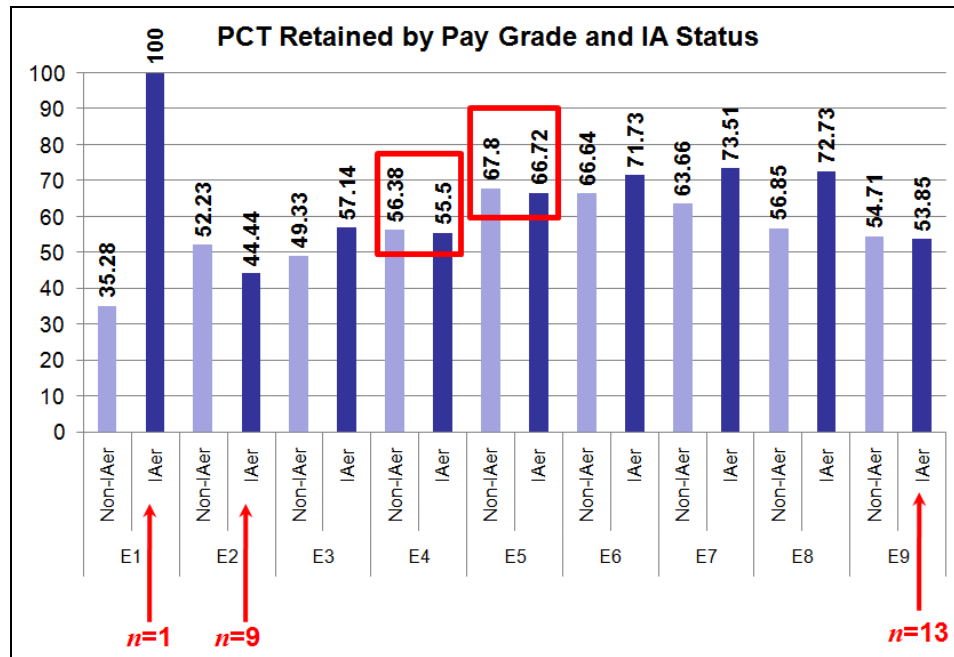
Figure 3.   Comparison of the percent retained by pay grade and IA status.
E-2, E-4, E-5, and E-9 personnel on IAs had slightly lower
retention rates than non-IAers in those pay grades.

Given that retention rates for Navy enlisted personnel and junior officers are generally higher for those who deployed via IA, we conclude the following: It is unlikely that IA deployment causes a significant decrease in retention propensity, at least in terms of the personnel outcomes observed thus far.

SOME CAVEATS FOR OUR FINDINGS

We temper these findings with a number of caveats:

- Though IA deployments have been occurring for six years now, we were only able to observe retention decisions on a fraction of those who have been on an IA deployment and these were more likely to be individuals

---

[1] We also did find decreases for E-2s and E-9s, but the number of IAers in those groups was too small to be considered definitive.

who deployed early in Operation Iraqi Freedom (OIF). Hence, the results observed thus far may not be typical of what is yet to come. See Chapter 4 for additional discussion.

- We were not able to identify those who volunteered for an IA deployment from those who did not. Thus, it is possible that a higher retention rate for volunteers is masking a lower rate for nonvolunteers. See Chapter 4 for additional discussion.

- Similarly, because this is observational data with strong self-selection effects likely present (at least for the volunteers), it is not possible to conclude that there is any causal relationship between IA deployments and increased retention rates.

RECOMMENDATIONS FOR FUTURE RESEARCH

Given the above caveats, we suggest that additional, on-going research is warranted. Some of our recommendations for such research are briefly summarized here. These and other recommendations are discussed in more detail in Chapter 4.

- **Recommendation: Repeat this Analysis Annually.** While our research did not find any strong negative effects of IA deployment on retention, retention outcomes have been observed on only a small fraction of those who have been on an IA deployment. Future analyses should be conducted to track these trends over time.

- **Recommendation: Identify and Analyze Nonvolunteers.** We were not able to identify those who did not volunteer for an IA deployment. If nonvolunteers can be identified, their retention patterns should be assessed since it is possible that higher rates of retention for volunteers are masking lower retention rates among nonvolunteers.

- **Recommendation: Analyze Reservists.** This analysis only considered active component (AC) sailors and officers. A majority of Navy personnel deployed via IA come from the reserve component (RC). Without

additional analysis, there is no reason to believe that the results of this analysis extend to reserve component personnel.

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LIST OF ACRONYMS

AC	Active component
AFQT	Armed Forces Qualification Test
CONUS	Continental United States
CNO	Chief of Naval Operations
DMDC	Defense Manpower Data Center
ETS	Expiration of term of service
IA	Individual augmentation
LT	Lieutenant
NPS	Naval Postgraduate School
OCONUS	Outside the continental United States
OEF	Operation Enduring Freedom
OIF	Operation Iraqi Freedom
RC	Reserve component
SSN	Social security number
SWO	Surface warfare officer
TFIA	Task Force Individual Augmentation

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CHAPTER 1: INTRODUCTION

OPNAVINST 1001.24, dated 5 July 2000, established the policies and procedures for U.S. Navy personnel individual augmentation (IA) deployment to combatant commands. As of September 2006, more than 10,000 sailors were serving globally in IA billets, of which more than 8,500 were assigned to the United States Central Command (*Rhumb Lines*, 2006). Of these, more than 2,000 sailors were serving in Iraq (*Navy Newsstand*, 23 January 2007). As of March 2008, almost 20,000 active duty sailors and naval officers have served or are serving on an IA deployment.

In early 2007, Admiral Mullen, then the Chief of Naval Operations (CNO), stated that IAs will continue: "I see this as a long-term commitment by the Navy. I'm anxious to pitch in as much as we possibly can, for the duration of this war. Not only can we do our share, but [we can] take as much stress off those who are deploying back-to-back, home one year, deployed one year and now are on their third or fourth deployment" (*Navy Newsstand*, 23 January 2007).

Given that IAs will continue for the foreseeable future, it is important to assess whether they are having an effect on enlisted and officer retention. Also in early 2007, Rear Admiral Masso, then the Assistant Deputy Chief of Naval Operations (Manpower, Personnel, Training and Education), addressed the Surface Navy Association Conference saying, "Since 2002, 82 percent of our IA's have come from the Reserve component, yet I see letters of resignation from officers listing a fear of IA duty as being the reason they are getting out. IA duty affects two percent of the surface warfare officer (SWO) community, yet if you speak to a junior officer on the waterfront, you would think that half of their wardroom are IAs" (*Navy Newsstand*, 11 January 2007).

Of course, simply because IAs are cited as a reason for leaving the service does not mean that IAs are, in fact, negatively affecting the retention of those who have been on an IA assignment (or those who have not experienced an IA, for that matter). For example, Fricker (2002) and Hosek and Totten (2002, 1998) studied the effects of hostile deployment on military retention in the 1990s. The conventional wisdom at that time

was that such deployments caused decreased retention. In fact, just the opposite effect was found: Fricker's work showed that officers who experienced one or more deployments, hostile or otherwise, were more likely to be retained in the service. Hosek and Totten found an equivalent effect for enlisted service members.

However, these results are now dated, given that both the pace and types of deployment have changed since Operation Enduring Freedom (OEF)—particularly in support of Operation Iraqi Freedom (OIF) since 2003. The 20,000 active-duty naval personnel who have served or are serving on an IA deployment represent almost five percent of the active Navy force. Furthermore, IA deployments differ fundamentally from conventional Navy deployments. For example, in an IA, sailors or officers are, as the name implies, deployed individually, whereas in conventional Navy deployments, personnel are deployed in units. In addition, IA deployments often come with much shorter notice than conventional Navy deployments and the individual is often deployed to a non-Navy unit. For these reasons and others, Navy leadership is interested in assessing whether IA deployments are affecting retention.

A. DESCRIBING INDIVIDUAL AUGMENTEES

As shown in Figure 4, between March 2002 and March 2008, almost 20,000 active component (AC) Navy personnel have been deployed as individual augmentees. As Figure 4 shows, the number of IA deployers ("IAers") has been steadily increasing every year since 2002.[2]

Figure 5 shows that the majority of IAers have been deployed to Iraq and Afghanistan, followed by other Middle Eastern countries. However, Navy personnel have also been deployed via IA to other countries around the world, including a substantial number to Guantanamo Bay, Cuba (contained in OCONUS), as well as to various locations in the continental United States (CONUS).

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[2] Though, with 1,843 personnel deployed in the first quarter of calendar year 2008, it is possible that 2008 will show the beginning of the leveling off of this trend.
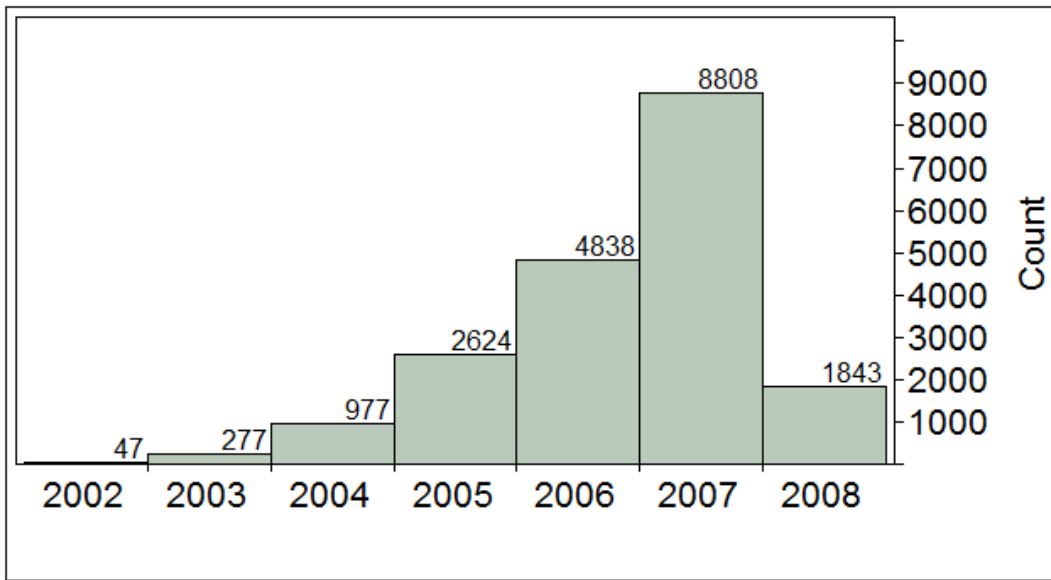
Figure 4. Number of active component Navy personnel starting an
individual augmentation deployment by year.
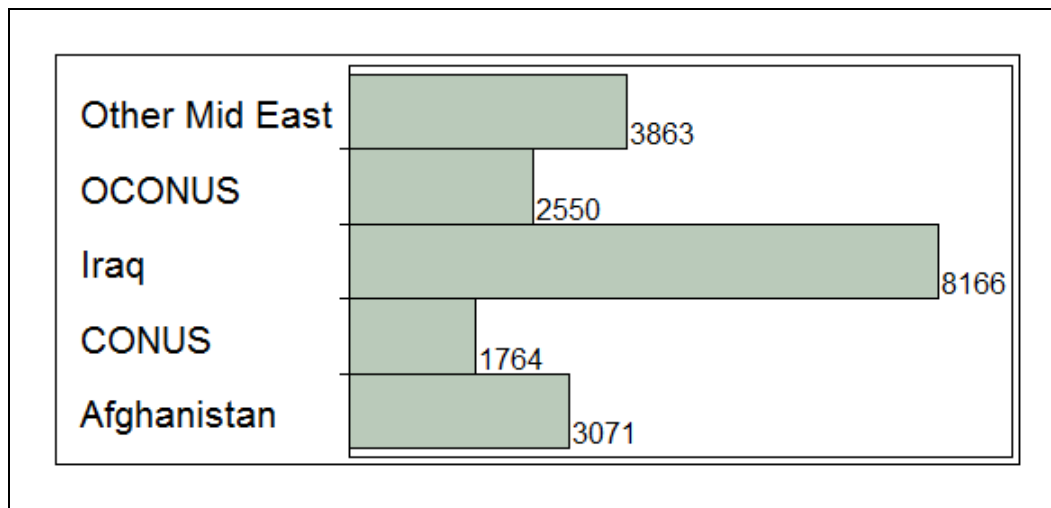
Figure 5. Deployment locations for active component Navy personnel
deployed via individual augmentation from March 2002 to
March 2008.

Figure 6 shows the distribution of the number of enlisted personnel, officers, and warrant officers. Seventy-two percent of the IAers were enlisted personnel, though officers are overrepresented in terms of their size as a fraction of the Navy.
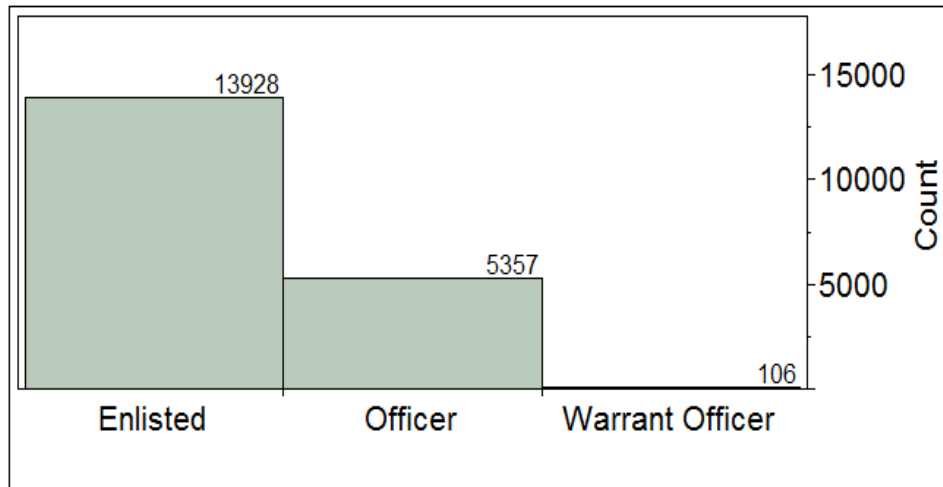
Figure 6.   Number of Navy enlisted personnel, officers, and warrant
officers deployed via individual augmentation from March 2002
to March 2008.

Figure 7 shows the distribution of enlisted IAer personnel by pay grade. While all pay grades have deployed, the majority (75 percent) of those who deployed via IA were petty officers (E-4 through E-6). Figure 8 shows the distribution of ranks for commissioned officers. Seventy percent of those who deployed were in ranks O-3 through O-5 (lieutenant through commander). A smaller number of warrant officers deployed. As Figure 9 shows, of warrant officers that deployed via IA, 86 percent were CWO2 and CWO3.
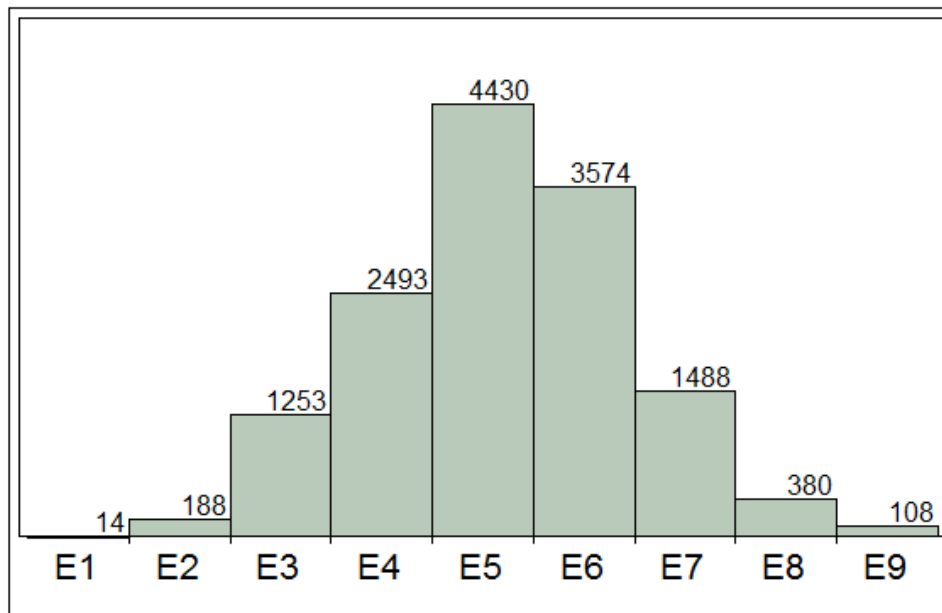
Figure 7. Pay grades of Navy enlisted personnel deployed via individual augmentation from March 2002 to March 2008.
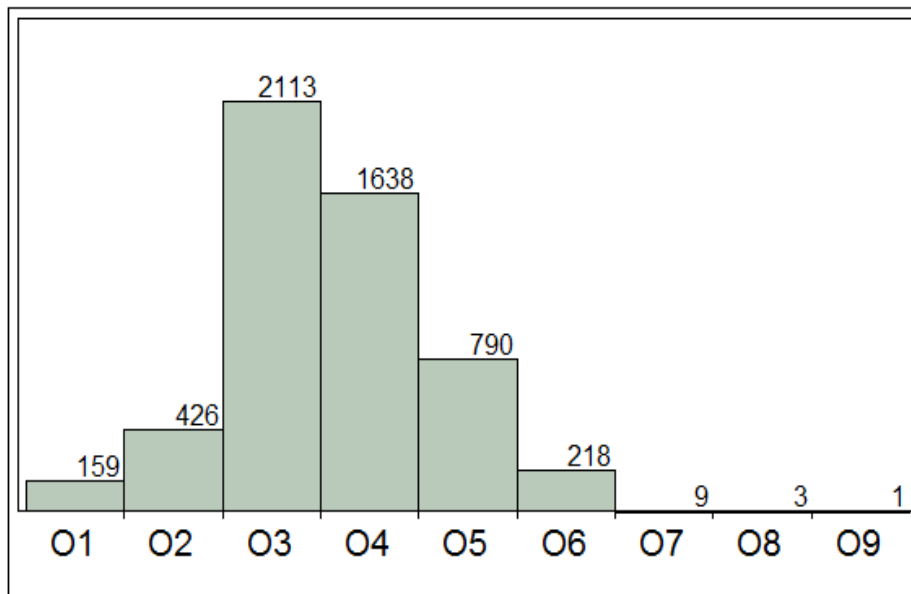
Figure 8. Ranks of Navy officers deployed via individual augmentation from March 2002 to March 2008.
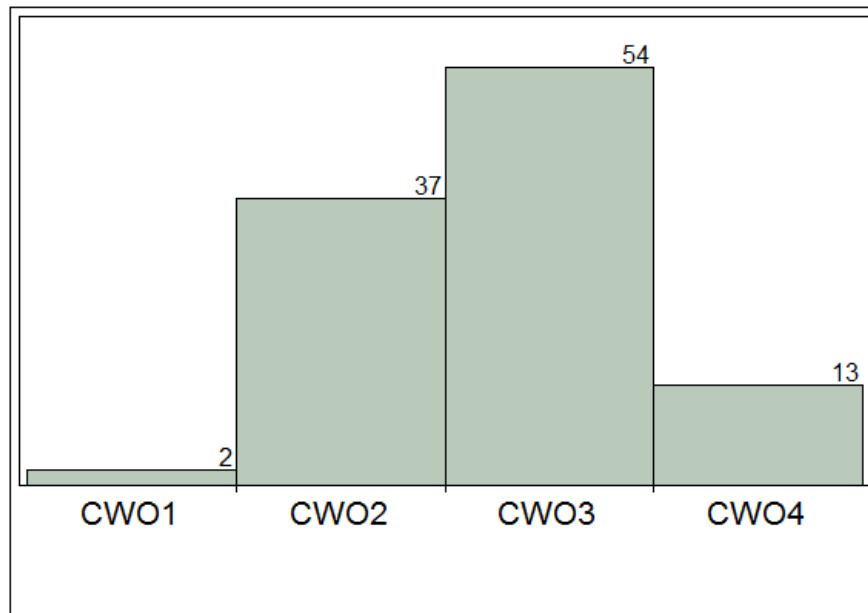
Figure 9.   Ranks of Navy warrant officers deployed via individual
augmentation from March 2002 to March 2008.

B.   ORGANIZATION OF THE REPORT

In addition to this introductory chapter, this report is divided into three additional chapters. Chapter 2 describes our analytical approach, including the data we used and how we determined when an individual made the decision to stay in or leave the Navy. Chapter 3 then presents our quantitative results, including both simple univariate comparisons and more complicated multivariate models. Finally, Chapter 4 summarizes our findings, discusses some of the limitations of the study, and provides recommendations for future research. These latter recommendations should be of interest to researchers and policy makers in the office of the Deputy Chief of Naval Operations (Manpower, Personnel, Training, and Education).

CHAPTER 2: ANALYTICAL APPROACH

The analytical approach we chose was to compare retention rates between those personnel who had been deployed via individual augmentation to equivalent cohorts of Navy personnel who had not been on an IA deployment. "Equivalent" means matching by (or controlling for in multivariate models) observable characteristics such as deployment experience, rank/pay grade, warfare specialty/rating, Armed Forces Qualification Test (AFQT) for enlisted personnel, family status, gender, and race/ethnicity.

The goal was to compare cohorts of sailors and junior officers who were both "at risk" of going on an IA deployment and of leaving the Navy. In particular, for enlisted personnel we had to observe at least one decision to either stay in or leave the Navy between March 2002 and September 2008. For junior officers, their initial service obligation had to expire after March 2002 and within a period of time such that we could determine whether they had decided to remain on active duty or leave the service. Paisant (2008) fully describes the logic for the junior officer analysis, so in the following paragraph we describe it for the enlisted personnel.

As Figure 10 illustrates, we divided the enlisted population up into "IAers" and "non-IAers." For both groups, we had to observe at least one decision to either stay in or leave the Navy between March 2002 and September 2008. "IAers" were then defined as someone who had been on an IA deployment and subsequently made a decision to stay in or leave the Navy. "Non-IAers" were defined as those individuals for whom we had observed a decision point, but they either had not ever been on an IA or their decision was made prior to their IA deployment. This latter case is important since at the point where a sailor had made a retention decision he or she had not experienced an IA deployment and hence was a non-IAer at that time.
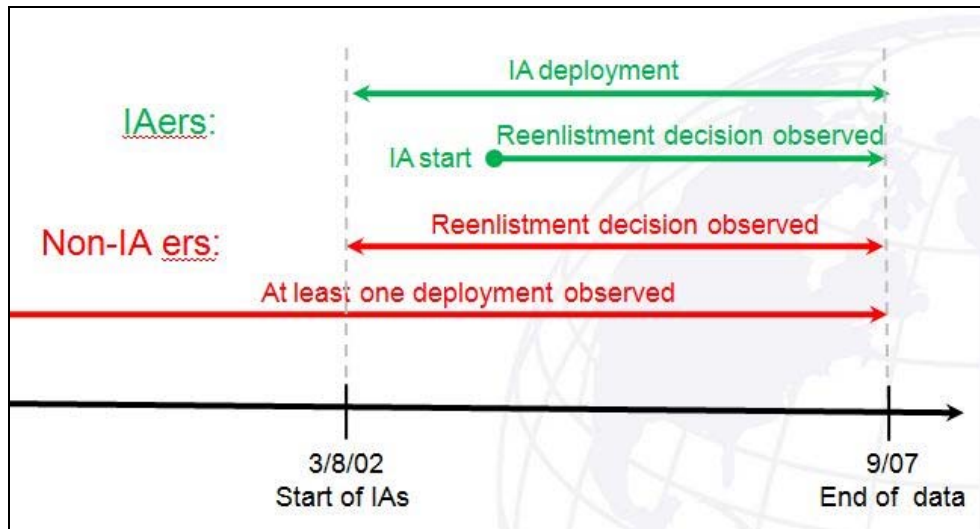
Figure 10.   Scheme for including personnel in the analysis and
                classifying them as IAer or non-IAer.

Implicit in this approach is that we had to ignore individuals for which we did not observe a retention decision. For the non-IAers, as Section A will describe, this left us with hundreds of thousands of observations against which to compare the IAers. However, there were significantly fewer decision points observed for IAers. This is both due to the small number of IAers compared to non-IAers, but also because more time must expire in order to observe decision points for those who have been on a recent IA deployment. This has implications for future research that we will discuss in Chapter 3.

For each individual, we then compared by, or controlled for, various observable characteristics. As shown in Figure 11, we chose variable characteristics (such as pay grade or family status) a year prior to the decision point, where the logic was that individuals start to form their decision sometime prior to the actual decision point.

Ultimately, we then compared retention rates between the IAers and non-IAers in the aggregate, by subgroups based on demographic characteristics (such as pay grade or family status), and then in multivariate models where we simultaneously controlled for all the demographic and other observable characteristics.

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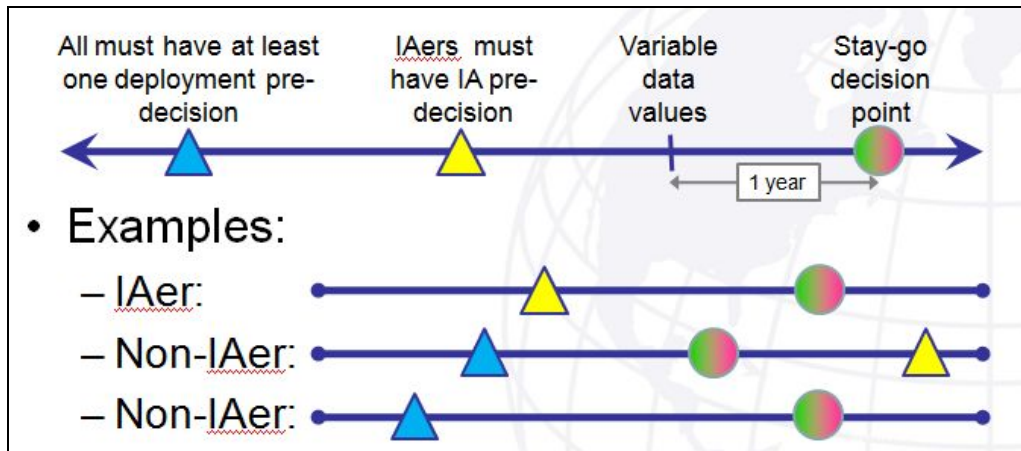
Figure 11.   Examples of classification of included personnel as IAer
or non-IAer.

A.   THE DATA

The data used to model both the enlisted force and junior officers consisted of a list of those AC Navy personnel sent on an IA deployment since March 2002 and monthly administrative records for all AC Navy personnel from October 1997 through September 2007. The former was provided by Pers-4 and, among other information, contained the name, rank/pay grade, SSN, and date deployed of each individual. The latter was an extract of the *Proxy Perstempo* file maintained by the Defense Manpower Data Center (DMDC) and contained monthly information on every person in the Navy, including name, rank/pay grade, social security number (SSN), designator/rating, gender, race/ethnicity, AFQT scores (for enlisted personnel), expiration of term of service (ETS), and a DMDC-derived measure of deployment experience.

The monthly Proxy Perstempo data was merged by SSN into a single longitudinal data file that contained the service history of all 846,653 personnel (represented by 893,461 records in which some SSNs appeared more than once) who were in the Navy at any point in time from October 1997 and September 2007. We then also merged the Pers-4 IA data onto the file by SSN. This data set was subsequently subset into the necessary analytical files, appropriately removing individual identifiers such as name and SSN. Here we describe this process for the enlisted data; see Paisant (2008) for a more detailed description of the junior officer data.

To create the analytical data file for the enlisted analyses, we first deleted all the officer records. Many of the SSNs with duplicate records seemed to refer to enlisted personnel who were later commissioned; we removed these (and all records for any SSN with duplicated records in the dataset). We then removed records for those personnel for whom we did not observe a reenlistment decision after March 2002, who did not have any deployment experience, who separated from the Navy involuntarily, or who did not have any data one year prior to their reenlistment decision. As Figure 12 shows, the 893,461 longitudinal records were thus reduced to 233,444 personnel who were enlisted in the Navy, made a reenlistment decision after March 2002, never separated involuntarily, and who had deployment experience.

Navy (DMDC) Data

893,461	Total active duty Navy personnel (10/97-9/07)
-174,049	Officers and records with duplicate SSNs
- 448,949	No decision after 3/02, all data missing, or invol. sep.
-36,637	No deployment experience (prior to decision)
-382	No data year prior to decision
233,444	

IA Data

15,469	Total Navy IA personnel (3/02-9/07)
-4,534	Officers and warrant officers
-8,972	No decision after IA deployment
1,963	

Figure 12.   DMDC and IA data counts for enlisted personnel.

In addition, after merging the IA data, of the 15,469 AC Navy personnel who began an IA deployment sometime between March 2002 and September 2007, 4,534 officer records were deleted and 8,972 had not made a reenlistment decision by September 2007 *after their IA deployment.* This left 1,963 enlisted personnel who had been on an IA deployment and for whom we were subsequently able to observe a decision to stay in or leave the Navy.

B.   INFERRING DECSION POINTS AND DEPLOYMENT EXPERIENCE

We had to infer a couple of important quantities to conduct our analysis, namely the decision point and whether an individual had (non-IA) deployment experience. Here we discuss how we conducted this inference for the enlisted personnel analysis. For the junior officer analysis, please see Paisant (2008).

1.   Defining the Decision Point

The DMDC data contained a variable that indicated the ETS for each individual for each month of data. For any given month, this variable generally contained the number of months remaining in an individual's enlistment contract. However, once the longitudinal data set was assembled, we were able to determine that this variable did not simply count down to zero for all individuals. For individuals who enlisted prior to the end of their contract, for example, at some point in the countdown it would suddenly jump up, often to 48 or 72, indicating a new four- or six-year enlistment contract. For others, after having counted down to zero, the ETS would perhaps jump up to one or two or three and then count down again, likely indicating an individual who had extended his or her enlistment contract for some number of months. For other individuals, the ETS would sometimes be zero for one or more months in the middle of a contract.

As a result, we used a number of rules to determine if and when individuals reenlisted. These rules were:

- If the ETS went to zero and stayed there for the remainder of the data, we determined that the individual left the Navy at the point the ETS hit zero.

- If the ETS went to zero in some month, but became nonzero again after more than six months, we determined that the individual left the Navy at the point the ETS hit zero, and rejoined in the later month.

- If the ETS went from a number greater than 3 directly to zero in some month and became nonzero within six or fewer months, we determined that the data was in error and that no event had taken place.

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- If the ETS went from a number less than or equal to 3 directly to zero in some month and became nonzero within six or fewer months, we determined that a reenlistment decision had taken place in that first nonzero month subsequent to the drop.

- If the ETS went from a number greater than 3 directly to zero and was never again nonzero, we determined that the individual had separated involuntarily.

- We recorded a reenlistment (or enlistment) decision in any month in which the ETS exceeded the previous month's ETS by more than 20, except that if such a jump occurred within the first 12 months of the first appearance of the individual in the data, the enlistment was marked at that individual's first month of nonzero ETS, not at the spot of that jump.

2.   Defining Deployment

In order to assess whether an individual had non-IA deployment experience, we used inferred measures in the Proxy Perstempo data. In particular, we relied on the PERS Tempo Subgroup field: see Section 8 of Appendix B of the Proxy Perstempo Codebook (available from DMDC).

CHAPTER 3: RESULTS

We compared retention rates in three different ways: aggregate comparisons, comparisons by individual demographic categories, and then using models to simultaneously control for demographic and other observable characteristics. We present these results in detail for enlisted personnel and summarize the results for junior officers. More detail for junior officer comparisons can be found in Paisant (2008).

A.   AGGREGATE RESULTS

We begin by simply comparing the retention rates between IAers and non-IAers, both enlisted personnel and junior officers. As shown in Figure 13, almost 67 percent of enlisted IAers reenlisted compared to almost 61 percent of non-IAers—a six percent difference in reenlistment rates in favor of the IAers. Moreover, as shown in Figure 14, the difference for junior officers is even greater: 66 percent of the junior officer IAers were retained compared to only 43 percent of the non-IAers—a 23 percent difference in retention rates in favor of the IAers.
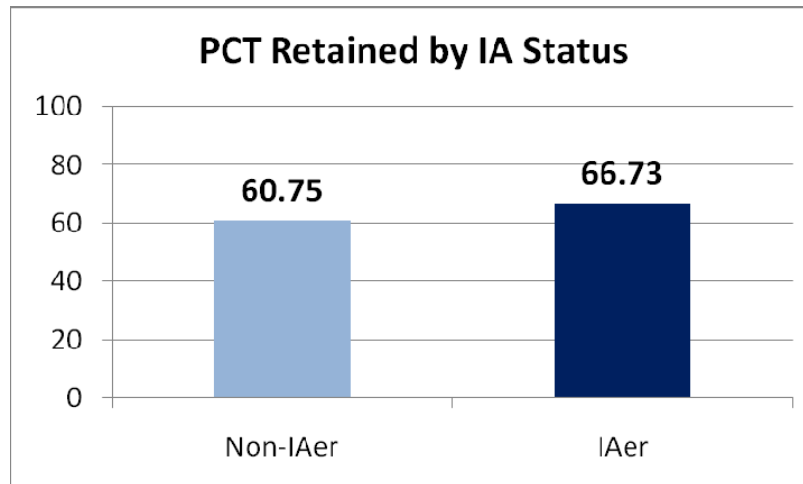
Figure 13.   Percent of non-IAer and IAer enlisted personnel retained.
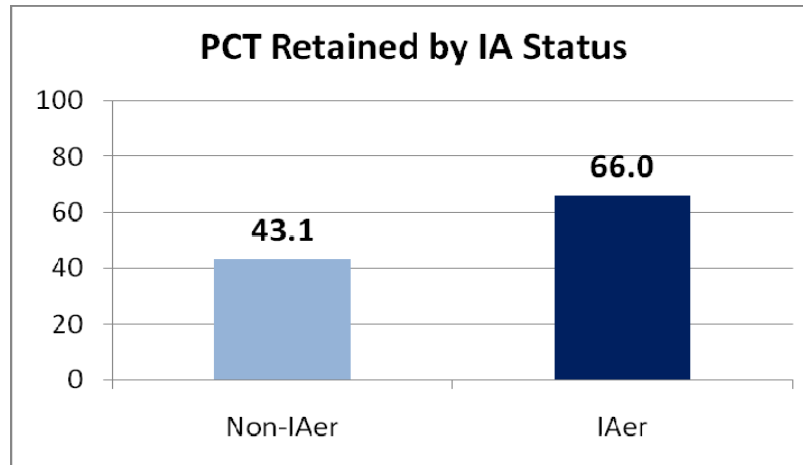
Figure 14.   Percent of non-IAer and IAer junior officers retained.

The tables in Figure 15 show the raw numbers (junior officers on the left and enlisted personnel on the right).

	IA Deployment?		
	No	Yes	
Left Navy	310	601	911
Retained	9,659	7,317	16,976
	9,969	7,918	17,887

	IA Deployment?		
	No	Yes	
Left Navy	90,865	653	91,518
Retained	140,616	1,310	141,926
	231,481	1,963	233,444

Figure 15.   Two-way tabulations of the number of junior officers (left table)
and enlisted personnel (right table) who were retained or not by
whether they went on an IA deployment or not.

A way to think about these results is in terms of "odds of retention" for each group, which is the fraction retained for that group divided by the fraction not retained. For the enlisted personnel, the odds that an IAer is retained is 2.01 (i.e., twice as many enlisted IAers are retained as lost), while the odds that a non-IAer is retained is 1.55. In this comparison, higher odds are better. Similarly, the odds of retention for a junior officer IAer is 1.94, while the odds for non-IAer junior officers is only 0.76. Odds of less than one means that more non-IAer officers are lost than retained, as we see in Figure 14.

We can further compare between IAers and non-IAers in terms of an "odds ratio," or the ratio of the odds IAers are retained to the odds non-IAers are retained. This reduces the comparison to one number. For the enlisted personnel, the odds ratio is 1.30

and for the junior officers it is 2.56. An odds ratio greater than one means that the odds that IAers are retained is greater than the odds that non-IAers are retained. While the odds ratios are a rather complicated way to distill the results of Figures 13 and 14 down into single numbers, we mention them here as they will be useful in Section C to compare these aggregate results with those from the multivariate models.

Regardless of the metric used, it is clear that the aggregate results show IAers have a higher retention rate than non-IAers for both enlisted personnel and junior officers. Of course, these aggregate results may mask retention issues for certain subgroups, an issue we explore in Section B.

B.   UNIVARIATE COMPARISON RESULTS

In this section, we evaluate how retention varies between IAers and non-IAers by various demographics: gender, family status, race/ethnicity, and pay grade. The question is whether there is evidence that IAers of a particular demographic have lower retention rates than their non-IA counterparts. We begin with enlisted personnel.

1.   Enlisted Personnel

Figures 16 and 17 show that when we compare retention rates between IAers and non-IAers by gender and family status, IAers are retained at a higher rate in all the comparison categories. For example, in Figure 16, we see that IAers have a higher retention rate for both males and females. Similarly, in Figure 17, IAers have a higher retention rate across all categories of family status.

In Figure 18, we see that this result continues to hold when we compare IAers to non-IAers by race/ethnicity. However, in Figure 19, we see that the retention rates for some pay grades are lower for IAers compared to their non-IAer counterparts. In particular, we see that the rates are lower for E-2s, E-4s, E-5s, and E-9s. In terms of the
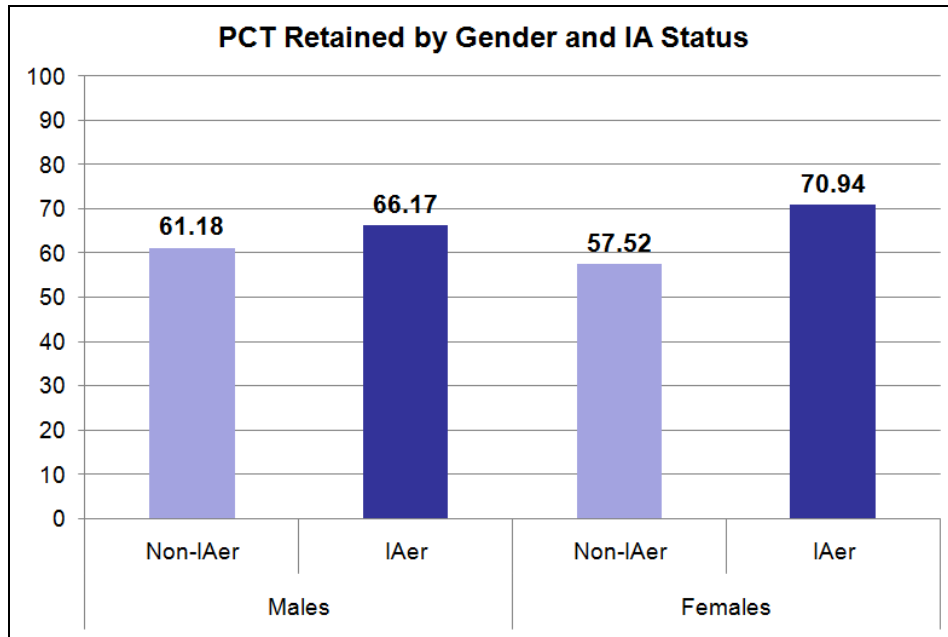
Figure 16. Comparison of the percent retained by gender and IA status. For both males and females, the percent retained is higher for those who deployed via IA.

Figure 17. Comparison of the percent retained by family and IA status. For all family statuses, the percent retained is higher for those who deployed via IA.

PCT Retained by Race/Ethnicity and IA Status

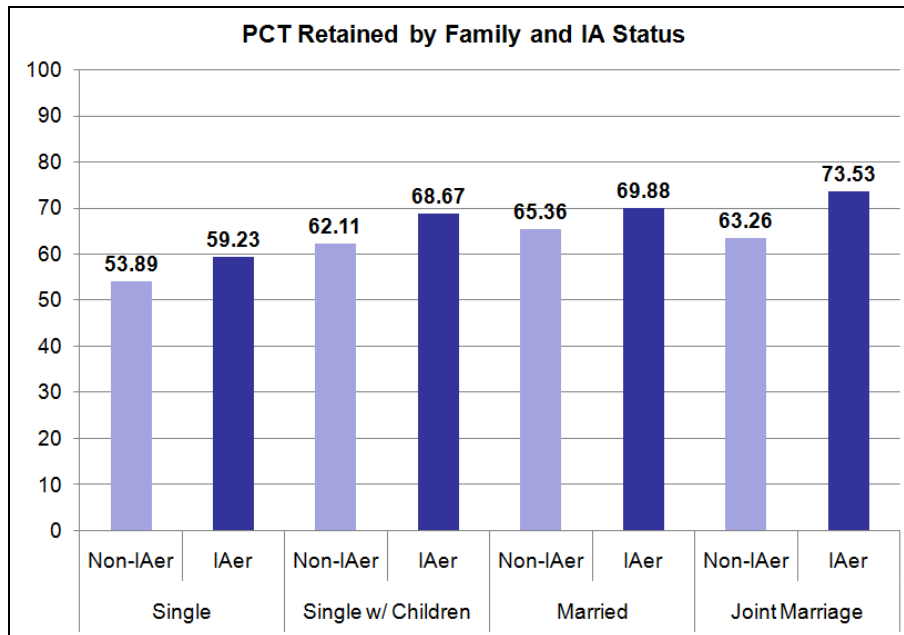Figure 18. Comparison of the percent retained by race/ethnicity and IA status. For all race/ethnicities, the percent retained is higher for those who deployed via IA.

PCT Retained by Pay Grade and IA Status
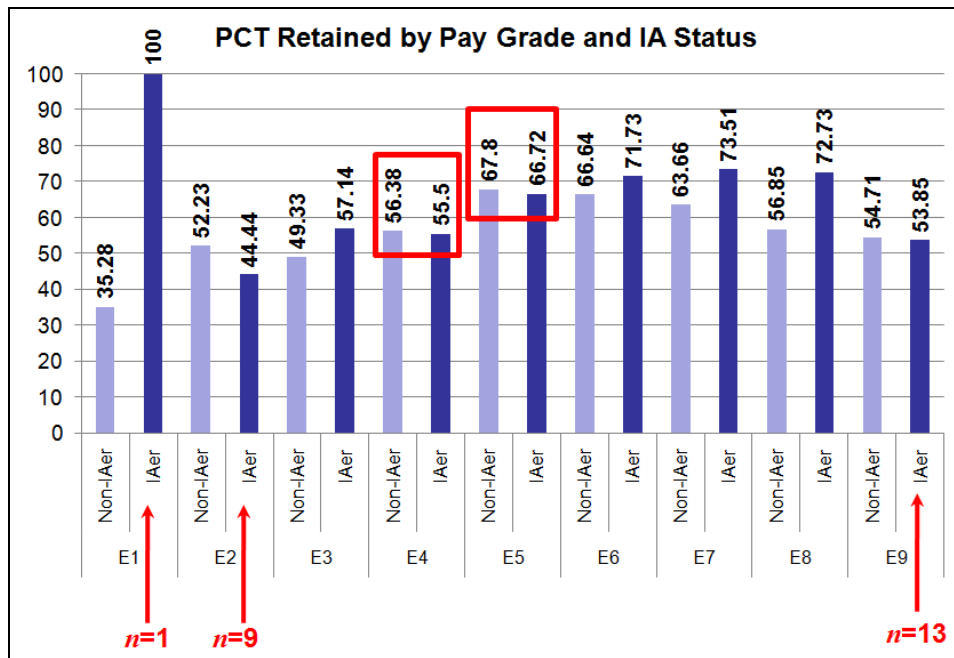
Figure 19. Comparison of the percent retained by pay grade and IA status. E-2, E-4, E-5, and E-9 personnel on IAs had a slightly lower retention rates than non-IAers in those pay grades.

E-2s and E-9s, the number of IAers is too small to reach any definitive conclusion from this comparison: there were only 9 E-2s and 13 E-9s for which we observed a retention decision.   However, for E-4s and E-5s, we observed hundreds of retention decisions (specifically, 373 for E-4s and 604 for E-5s), though the difference in retention rates was only about one percent in each case.

A closer inspection of Figure 19 suggests that there may be a relationship between pay grade and retention, where *the difference* in retention rates increases with increasing pay grade. To assess this, taking into account the number of individuals observed in each pay grade, we conducted a weighted regression of the difference in percent retained (i.e., percent IAers retained minus percent non-IAers retained).

Figure 20 shows the difference in percent retained and the number of IAs (which we used as the weighting factor). On the left, we see the fitted regression line overlaid on the plot of the percent differences versus pay grade and at the bottom, the resulting equation of the line. Assuming a linear relationship, this suggests there is about a three-percent increase in the difference for every pay grade increase. It also suggests that, treating our observations as a sample from the whole population of possible Naval personnel, retention rates are lower for IAers in the population with pay grades less than E-5, than for non-IAers in that population.

Pay Grade	Δ Percent Retained	Number IAs
E1	64.72	1
E2	-7.79	9
E3	7.81	56
E4	-0.88	373
E5	-1.08	604
E6	5.09	573
E7	9.85	268
E8	15.88	66
E9	-0.86	13

$$\Delta \text{ Pct Retained} = -12.8 + 2.9 * \text{Pay Grade}$$

Figure 20.   A weighted linear regression of the difference (Δ) in percent retained by pay grade.

Now, it is not obvious how or why such a difference in pay grades might arise. We hypothesize that it is not an effect of pay grade *per se*, but rather some other (unobserved) factor that is correlated with pay grade, such as the fraction of IA volunteers within each pay grade. We discuss this more in Chapter 4.

2. Junior Officers

The story is very similar for junior officers. Figure 21 shows the retention proportions among IAers and non-IAers by gender for this subgroup (see Paisant [2008] for the details of which officers are included here). In both genders, the IAer retention proportion is higher than that of the non-IAers, with a somewhat larger difference among females.

PCT Retained by Gender and IA Status

	Males		Females	
	Non-IAer	IAer	Non-IAer	IAer
	45.26	66.5	35.21	62.79

Figure 21. Comparison of the percent retained by gender and IA status. For both genders, the percent retained is higher for those who deployed via IA than for those who did not.

Figure 21, analogous to Figure 17, shows that IAers are retained at a higher rate than non-IAers for all family types, and Figures 22 and 23 shows the corresponding results by family status and by race. (In this last case, some of the sample sizes are small.) Overall, we can see the same basic result with the junior officers that was seen among the enlisted population: IAers are retained at higher rates than non-IAers.

PCT Retained by Family and IA Status
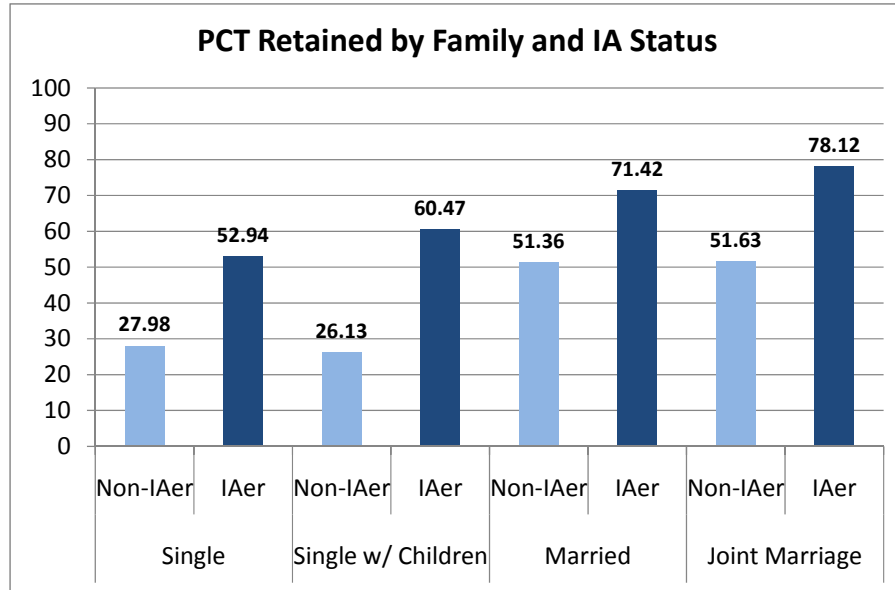
Figure 22. Comparison of the percent retained by family type and IA status. For all family types, the percent retained is higher for those who deployed via IA than for those who did not.
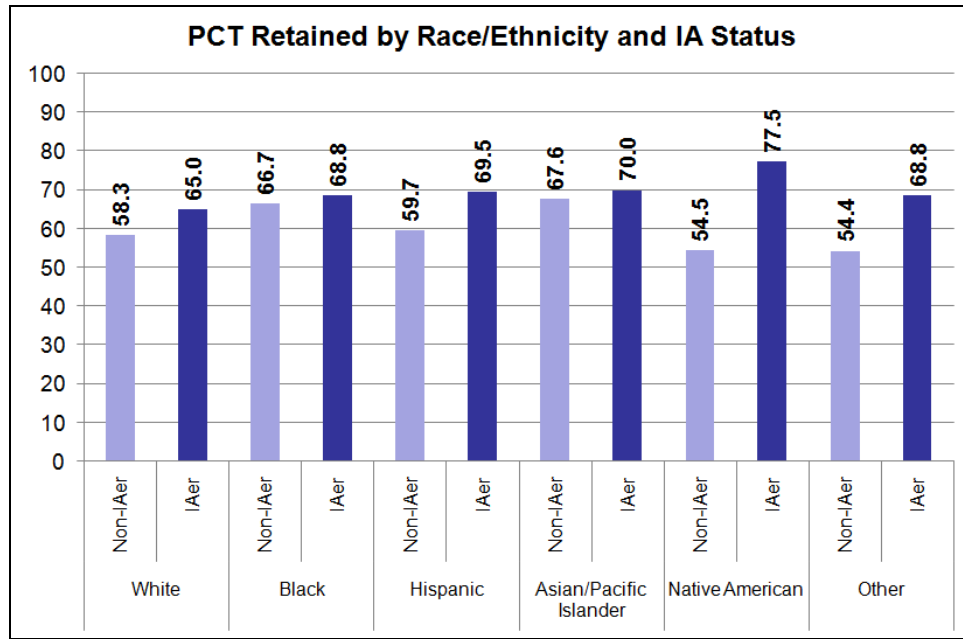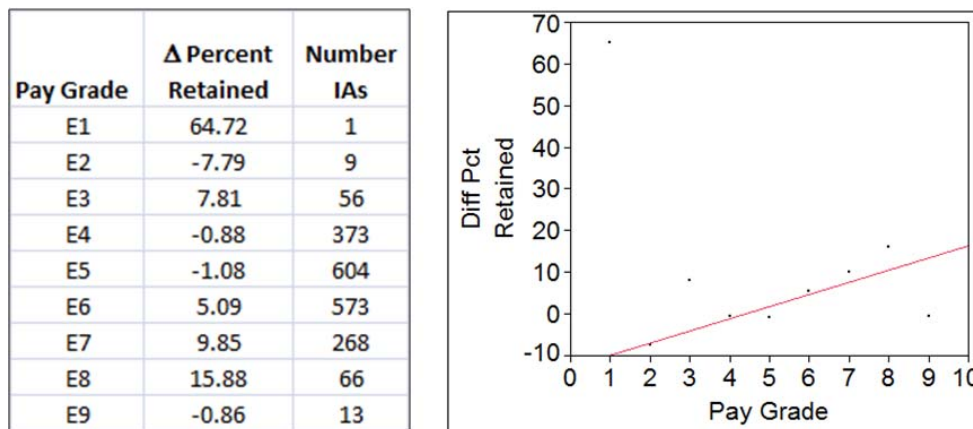
PCT Retained by Race/Ethnicity and IA Status
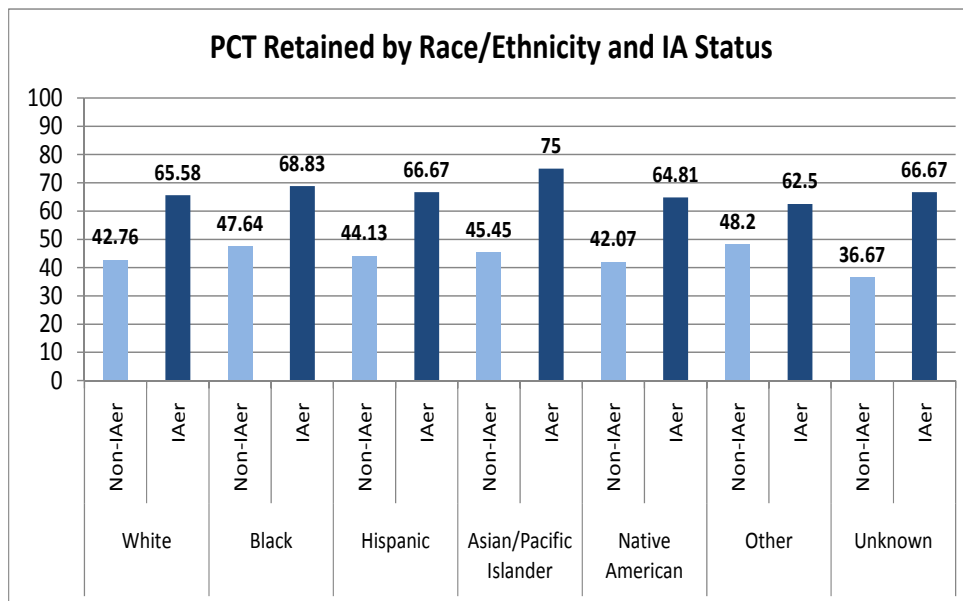
Figure 23. Comparison of the percent retained by race and IA status. The percentage retained is higher for those who deployed via IA than for those who did not for every race group; although some of the sample sizes are quite small.

Finally, Figure 24 shows that retention percentages are higher for IAers than non-IAers at every rank. (We have excluded ranks O1 and O2 because there were, respectively, one and three IAers at those ranks.)

PCT Retained by Pay Grade and IA Status
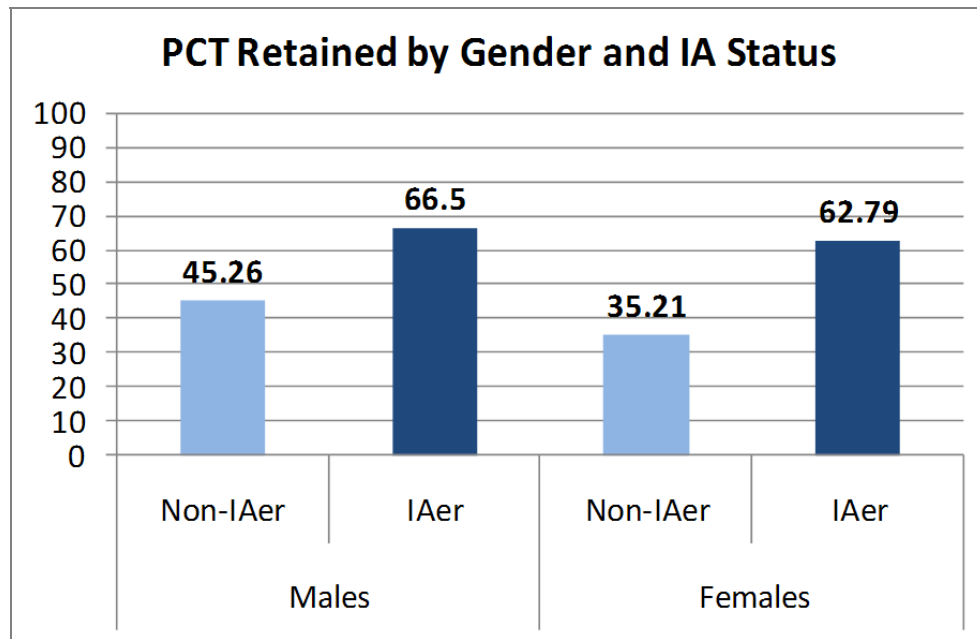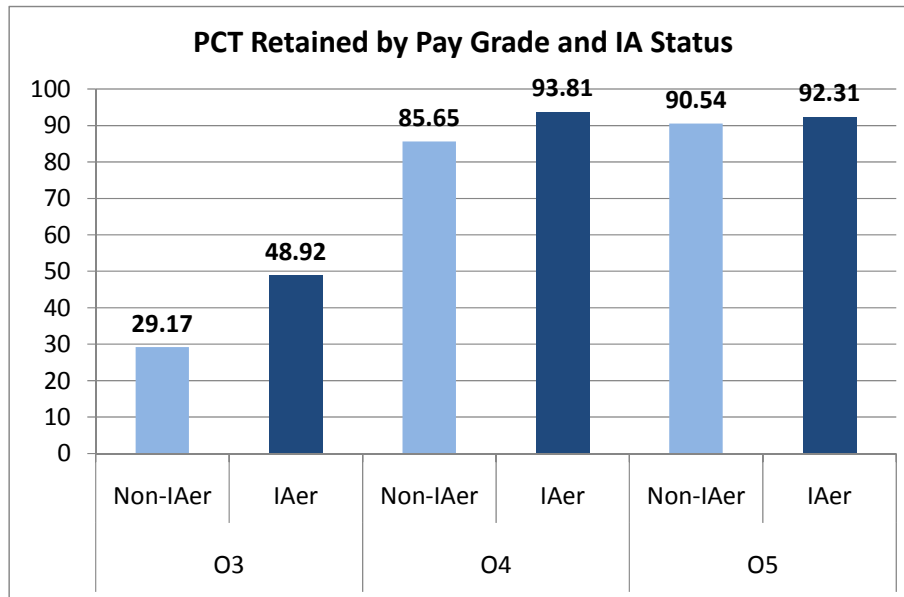

Figure 24. Comparison of the percent retained by rank and IA status. The percentage retained is higher for those who deployed via IA than for those who did not for each of the three ranks.

C. MULTIVARIATE MODEL RESULTS

While the foregoing comparisons assess the differences in retention rates between IAers and non-IAers by various demographic categories, these categories are only assessed one at a time. It is possible that the previous results could differ in a comparison that simultaneously incorporates all the demographics.

To conduct such a comparison, we employed a standard statistical modeling technique—logistic regression—to construct our models. For those unfamiliar with logistic regression, the Appendix provides a brief overview of the methodology.

1. Enlisted Personnel

For the enlisted personnel models, we included covariates in the model to account for known retention rate differences among various demographics (gender, race/ethnicity,

and family status), covariates that act as surrogates for personnel quality (AFQT, education), a covariate to account for seniority (pay grade), and a covariate to act as a surrogate for changes in the U.S. economy that may affect overall retention propensity (decision year).

We then ran two separate models, one comparing all IAers to non-IAers and a second one comparing only those IAers deployed to Iraq and Afghanistan to non-IAers. The results are shown in Tables 1 and 2. As described in the Appendix, exponentiating the coefficient for the IA indicator gives the odds ratio for the retention of IAers versus the retention of non-IAers. We see from Table 1 that the odds ratio for all IAers is $\exp(0.426) = 1.53$ and, for Table 2, the odds ratio for Iraq and Afghanistan IAers is $\exp(0.659) = 1.93$. The result is that, after simultaneously controlling for observable demographics and other characteristics, the odds ratio *increased* from 1.3 in the raw data (see Section A of this chapter) to 1.53 and then, focusing only on those who deployed to Iraq and Afghanistan, it further increased to 1.93.

Term	Estimate	Std Error	ChiSquare	Prob>ChiSq
Intercept	–0.386	0.144	7.2	0.0072
Race/Ethnicity[Am. Ind/Alaskan Native]	–0.162	0.026	38.6	<.0001
Race/Ethnicity[Asian/Pac Islander]	0.298	0.018	261.7	<.0001
Race/Ethnicity[Black]	0.263	0.013	387.5	<.0001
Race/Ethnicity[Hispanic]	–0.058	0.015	14.8	0.0001
Race/Ethnicity[Other]	–0.132	0.041	10.3	0.0013
Family Status[Joint Marriage]	0.124	0.020	39.2	<.0001
Family Status[Married]	0.159	0.009	295.5	<.0001
Family Status[Single]	–0.249	0.010	673.3	<.0001
AFQT[Cat I]	0.613	0.079	61.0	<.0001
AFQT[Cat II]	0.687	0.077	80.1	<.0001
AFQT[Cat IIIA]	0.603	0.077	61.6	<.0001
AFQT[Cat IIIB]	0.565	0.077	54.2	<.0001
AFQT[Cat IVA]	0.200	0.079	6.4	0.0115
AFQT[Cat IVB]	–1.129	0.101	123.7	<.0001
AFQT[Cat IVC]	–0.994	0.135	54.0	<.0001
Pay Grade[E1]	–0.748	0.077	93.2	<.0001
Pay Grade[E2]	–0.198	0.039	26.3	<.0001
Pay Grade[E3]	–0.238	0.017	190.0	<.0001
Pay Grade[E4]	0.006	0.015	0.2	0.6601
Pay Grade[E5]	0.412	0.015	743.0	<.0001
Pay Grade[E6]	0.321	0.016	412.8	<.0001
Pay Grade[E7]	0.191	0.019	101.2	<.0001
Pay Grade[E8]	–0.033	0.028	1.4	0.2374
Education[Bachelor's]	–0.079	0.124	0.4	0.5218
Education[Doctorate]	0.398	0.500	0.6	0.4256
Education[GED/Alt]	0.028	0.122	0.1	0.8154
Education[HS]	0.139	0.121	1.3	0.2497
Education[LT HS]	–0.014	0.124	0.0	0.9109
Education[Masters]	–0.051	0.165	0.1	0.7571
Education[Nursing Degree]	–0.422	0.682	0.4	0.5363
Decision_Year[2002]	0.626	0.010	4200.9	<.0001
Decision_Year[2003]	–0.067	0.009	50.4	<.0001
Decision_Year[2004]	–0.017	0.009	3.1	0.0775
Decision_Year[2005]	–0.099	0.010	101.1	<.0001
Decision_Year[2006]	–0.098	0.010	88.2	<.0001
IA_Deployer_Ind	0.426	0.051	70.8	<.0001

Table 1. Results for enlisted model comparing all enlisted IAers versus all other Navy enlisted with deployment experience.

Term	Estimate	Std Error	ChiSquare	Prob>ChiSq
Intercept	–0.390	0.144	7.4	0.0066
Race/Ethnicity[Am. Ind/Alaskan Native]	–0.165	0.026	39.8	<.0001
Race/Ethnicity[Asian/Pac Islander]	0.298	0.018	261.5	<.0001
Race/Ethnicity[Black]	0.265	0.013	390.4	<.0001
Race/Ethnicity[Hispanic]	–0.059	0.015	14.8	0.0001
Race/Ethnicity[Other]	–0.131	0.041	10.1	0.0015
Family Status[Joint Marriage]	0.123	0.020	37.9	<.0001
Family Status[Married]	0.161	0.009	298.9	<.0001
Family Status[Single]	–0.249	0.010	670.0	<.0001
AFQT[Cat I]	0.612	0.079	60.7	<.0001
AFQT[Cat II]	0.689	0.077	80.5	<.0001
AFQT[Cat IIIA]	0.605	0.077	62.0	<.0001
AFQT[Cat IIIB]	0.565	0.077	54.2	<.0001
AFQT[Cat IVA]	0.205	0.079	6.7	0.0095
AFQT[Cat IVB]	–1.128	0.102	123.4	<.0001
AFQT[Cat IVC]	–1.004	0.136	54.8	<.0001
Pay Grade[E1]	–0.750	0.078	93.6	<.0001
Pay Grade[E2]	–0.197	0.039	25.8	<.0001
Pay Grade[E3]	–0.237	0.017	187.8	<.0001
Pay Grade[E4]	0.008	0.015	0.3	0.5675
Pay Grade[E5]	0.413	0.015	743.7	<.0001
Pay Grade[E6]	0.322	0.016	412.5	<.0001
Pay Grade[E7]	0.190	0.019	99.0	<.0001
Pay Grade[E8]	–0.035	0.028	1.6	0.2106
Education[Bachelor's]	–0.080	0.124	0.4	0.5173
Education[Doctorate]	0.399	0.500	0.6	0.4245
Education[GED/Alt]	0.028	0.122	0.1	0.8171
Education[HS]	0.140	0.121	1.3	0.2464
Education[LT HS]	–0.014	0.124	0.0	0.9081
Education[Masters]	–0.053	0.165	0.1	0.7475
Education[Nursing Degree]	–0.420	0.682	0.4	0.5382
Decision_Year[2002]	0.626	0.010	4199.3	<.0001
Decision_Year[2003]	–0.067	0.009	50.5	<.0001
Decision_Year[2004]	–0.017	0.009	3.1	0.0789
Decision_Year[2005]	–0.100	0.010	102.0	<.0001
Decision_Year[2006]	–0.098	0.011	86.8	<.0001
IA_Deployer_Ind	0.659	0.075	77.4	<.0001

Table 2.   Results for enlisted model comparing only those enlisted IAers who deployed to Iraq or Afghanistan versus all other Navy enlisted with deployment experience.

2. Junior Officers

Here we reproduce the results of Paisant (2008). As shown in Table 3, in his model he controlled for race/ethnicity, family status, and warfare specialty. After controlling for these demographics, the odds ratio for the retention of IAers is $\exp(0.944) = 2.57$. This turns out to be insignificantly different from the raw odds ratio of 2.56 calculated in Section A of this chapter. Hence, though there are effects attributable to these population demographics, once they are accounted for, there is no real difference in the odds ratio attributable to IA deployments.

	Log odds (β)	Std. error	t value
(Intercept)	-0.235	0.146	-1.61
Gender	-0.356	0.042	-8.47
White	0.286	0.119	2.39
Black	0.585	0.132	4.41
Hispanic	0.392	0.132	2.96
Indian	0.441	0.197	2.23
Asian	0.326	0.134	2.43
Other	0.549	0.208	2.64
Married	-0.176	0.077	-2.28
Single w/dep	-1.243	0.096	-12.98
Single w/o dep	-1.154	0.080	-14.39
DesigOther	0.235	0.046	5.14
DesigSub	0.171	0.072	2.36
DesigSupply	0.573	0.077	7.44
DesigSurface	0.231	0.052	4.47
IA	0.944	0.074	12.74

Table 3.   Results for junior officer logistic regression model (Paisant, 2008).

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CHAPTER 4: SUMMARY

In this analysis, we evaluated whether retention rates for Navy enlisted personnel and junior officers differ between those personnel who have been deployed via IA and their Navy colleagues who experienced conventional Navy deployments. In our models, we have attempted to control for differences in retention behavior attributable to other personnel demographics—such as rank/pay grade, family status, gender, and race/ethnicity—before evaluating the effect of IA deployment on retention.

Overall, we find little evidence thus far that IA deployment is hurting retention rates among those who have experienced one or more IA deployments. In fact, in almost all of our comparisons, the retention rates of those who have had one or more IA deployments were *higher* than their Navy colleagues who have only been on conventional Navy deployments. The only categories where we found lower retention rates for IAers compared to non-IAers were for E-3s and E-4s and, in these cases, the decrease in retention rates was only about one percent. (We also found decreases for E-2s and E-9s, but the number of IAers in those groups was too small to be considered definitive.)

These findings must be tempered with a number of caveats:

- Though IA deployments have been occurring for six years now, we were only able to observe retention decisions on a fraction of those who have been on an IA deployment and these were more likely to be individuals who deployed early in OIF. Hence, the results observed thus far may not be typical of what is yet to come. See paragraph A.1 below for additional discussion.

- We were not able to identify those who volunteered for an IA deployment from those who did not. Thus, it is possible that a higher retention rate for volunteers is masking a lower rate for nonvolunteers. See paragraph A.2 below for additional discussion.

- Similarly, because this is observational data with strong self-selection effects likely present (at least for the volunteers), it is not possible to conclude that there is any causal relationship between IA deployments and increased retention rates. For example, it could be that volunteers are also more likely to stay in the Navy and hence the higher retention rates for IAers are simply due to the choice of the IA volunteers.

Furthermore, it is important to emphasize that our results are about aggregate retention behavior, not individual retention propensities. We expect Navy leadership is most interested in the former where, as we have discussed, there is some utility in knowing that retention rates among IAers (at least as observed thus far) are generally higher. However, the latter is also relevant since it is possible that the IA experience does decrease each individual's retention propensity slightly, but not enough to overcome the inherently higher retention propensities in the self-selected volunteer group. Hence, for example, while we observed higher retention rates for the IAers, it may be that they are not as high as they would have been in the absence of the IA program. Thus, we emphasize that in this research we were not able to assess whether:

- any particular individual's propensity to remain on active duty was affected by his or her IA deployment experience, nor

- whether the retention propensity of individuals who have not yet been deployed as individual augmentees were affected by the possibility they could be sent on an IA deployment.

That said, based on this research, we conclude the following:

- With the exception of some junior enlisted pay grades (E-3s and E-4s), the retention rates for Navy enlisted personnel and junior officers is higher for those who deployed on an IA than for other Navy personnel who experienced conventional Navy deployments.

- The hypothesis that IA deployment causes a significant decrease in retention propensity is unlikely to be true, at least in terms of the personnel

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outcomes observed thus far. If it was, we would have expected to see lower retention rates for IAers than for non-IAers.

A. RECOMMENDATIONS FOR FUTURE RESEARCH

Given the previous caveats, and that we were not able to assess some groups, we suggest that additional, on-going research is warranted. In particular, we recommend consideration of the following six areas for future research.

1. Repeat Analysis Annually

While this research has not found any strong negative effects on retention, it is important to keep in mind that outcomes have been observed on only a small fraction of those who have been on an IA deployment. An outcome for enlisted personnel is the decision to reenlist or leave the Navy and for junior officers it is the decision to continue in the Navy after the initial service obligation or leave the Navy. In both cases, it takes between four and six years to observe such an outcome (either from the start of an enlistment contract for enlisted personnel or from commissioning for junior officers). Since IAs have only been conducted for the past six years, for most of those who have deployed via IA, their decision to stay or leave the Navy has not been observed. Thus, as outcomes are observed for more sailors and officers, the conclusions of this report could change.

Furthermore, it is important to note that in this data we were more likely to observe outcomes for those who deployed earlier rather than more recently. To the extent that those individuals differed in their Navy career intentions from later individuals who deployed via IA, these results could also change. In addition, the course of the wars in Iraq and Afghanistan has changed substantially over the course of the past six years and will likely to continue to change into the future. To the extent that an IAer's deployed experience affects his or her Navy career intentions, these changes in the course of the wars may affect the observed retention patterns.

2. Identify and Analyze Nonvolunteers

In this research, we were not able to identify those who volunteered for an IA deployment. Presumably, such individuals are more likely to stay in the Navy. If true, and if volunteers were more likely to be senior enlisted personnel, then the observed association between increasing retention and pay grade for IAers may actually be attributable to volunteer status. Or, perhaps more likely, there exists both an effect due to seniority and volunteer status. In any case, we are not able to identify the volunteer effect due to lack of data.

In addition, a relevant analysis, if nonvolunteers can be identified, is to assess the retention patterns of nonvolunteers. That is, if the assumption that volunteers are more likely to stay in the Navy, and because they volunteered are more likely to positively view their IA deployment experience, then in the current analysis, the volunteers may be masking lower retention rates among the nonvolunteers. That is, if there is a negative effect of IA deployment, it is presumably most likely to be observed among the nonvolunteers.

In discussion with Pers-4, it is our understanding that some data is available for some IAers regarding their volunteer status. Though we were not able to obtain that data for this study, future studies should incorporate it, if possible.

3. Analyze Reservists

As described in Chapter 1, the majority of IAers are reservists. This analysis only considered AC sailors and junior officers. There is no reason to believe that the effects of IA deployment are the same for RC personnel as for AC personnel, and hence these results should not be extrapolated to RC personnel. Indeed, there are many ways in which the two components differ, and one can rationalize many ways in which an IA deployment might have a more positive or more negative effect on RC personnel (compared to AC personnel).

4. Analyze Mid-Grade Officers and Warrant Officers

Because outcomes for mid-grade officers (defined as O-3s past their initial service obligation decision point through 0-5s) and warrant officers were not sufficiently observed, they were not analyzed in this study. That is, as described in paragraph A.1 above, decision points for many of sailors and junior officers have not been observed in the six years since IA deployments began. This problem is even greater for mid-grade officers and warrant officers who have made a least an initial commitment to a naval career and whose decision timelines are even more extended.

Simply put, not enough time has expired to observe enough mid-grade and warrant officers with IA deployment experience leaving the service. However, as time progresses, such analyses, if they are desired, will become possible.

5. Evaluate Using Other Outcomes

In this analysis, we have used retention as the relevant comparison measure between those who have been on an IA deployment and those who have not. In the process of conducting the evaluation, however, we removed those personnel who were involuntarily separated, under the assumption that we were interested in comparing the retention and separation rates among those who chose to stay in or leave the Navy.

However, other measures may be relevant. In particular, if IA deployments are causing increases in involuntary separations (say for mental health reasons), then our analysis would not have been able to detect this and such an increase could also be relevant to the question of how IAs are affecting retention in the Navy. Thus, future studies could assess the types and rates of involuntary separation between IAers and non-IAers.

6. Conduct Survey and Connect Attitudinal to Outcome Data

In these analyses, we have conducted an analysis of the most concrete measure of whether IAs are affecting retention by looking at actual retention behavior. However, this is an evaluation of aggregate behavior and, as such, it cannot assess whether, even

though an individual was retained in the Navy, his or her future propensity to remain on active duty has been increased or decreased in some way by the IA experience.

One way to take a step closer to evaluating this and similar questions is by using a survey to collect attitudinal and other data on those who deployed via IA and then connect the survey data to the outcome data. In so doing, it may be possible to assess whether and how various aspects of the IA deployment experience influenced an individual's decision to stay in or leave the Navy.

APPENDIX: OVERVIEW OF LOGISTIC REGRESSION

Standard logistic regression models were used for both the enlisted and junior officer models. An interesting deviation from their usual employment, however, is that we have virtually the entire population of (eligible) sailors and naval officers in our data. Thus, we are not using the models for making inference to a larger population from a sample. Rather, we are using the models to parsimoniously summarize the relationship between retention and IA deployment, after accounting for other factors that affect retention.

Logistic regression is a well-known statistical technique for modeling data with binary outcomes—such as whether an individual decides to remain on active duty or not. Detailed discussions and the mathematical development of the technique can be found in textbooks such as McCullaugh and Nelder (1991) or Hosmer and Lemeshow (1989). We denote the outcome for individual i by Y_i, which is 1 if the individual stays on active duty and 0 otherwise. The basic form of the model is then

$$Y_i = \begin{cases} 0 & \text{with probability} \quad 1 - p_i \\ 1 & \text{with probability} \quad p_i \end{cases}$$

so that p_i is the probability that individual i will stay on active duty, and

$$\log\left(\frac{p_i}{1 - p_i}\right) = \beta_0 + \beta_1 X_{i1} + \cdots + \beta_n X_{in}.$$

The ratio of $\dfrac{p_i}{1 - p_i}$ is referred to as the odds for individual i. The coefficients in the model represent the change in the log odds for a unit change in an X covariate. The Xs capture the various demographic characteristics for the individuals, such as gender, race, occupation, and rate of deployment.[3] In logistic regression, the log-odds are generally assumed to be a linear function of various covariates.

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[3] An X with two subscripts is a particular value for a particular observation, so X_{3G} is the gender of person number 3. An X with one subscript refers to the whole set of observations for that characteristic, so X_M refer to the whole set of marital status values.

The odds are defined as the probability that an individual with a particular set of characteristics will stay in the military, divided by the probability that he or she will not. The odds can be any number between zero and infinity. Odds of one means that an individual with those characteristics is equally likely to separate as not. Odds greater than one means that such an individual is more likely to stay on active duty, while odds less than one means the individual is more likely to separate.

Through algebraic manipulation, we can explicitly estimate the probability of retention for the ith individual, $\hat{p}_i$, as a function of the coefficients:

$$\hat{p}_i = \frac{\exp(\hat{\beta}_0 + \hat{\beta}_1 X_{i1} + \cdots + \hat{\beta}_n X_{in})}{1 + \exp(\hat{\beta}_0 + \hat{\beta}_1 X_{i1} + \cdots + \hat{\beta}_n X_{in})},$$

where the $\hat{\beta}$s are the coefficients estimated from the data via maximum likelihood.

Unfortunately, changes in $\hat{p}_i$ are not linear with changes in the $\hat{\beta}$, so there is no simple way to summarize how the $\hat{\beta}$s directly affect the probability of retention over all possible ranges. However, $\exp\left(\hat{\beta}_j\right)$ can be interpreted as the *odds ratio* (OR) when X_j is a binary characteristic. The odds ratio is simply the ratio of the odds when $X_j = 1$ to the odds when $X_j = 0$ and is roughly equivalent to the relative risk. If OR = 2, then we interpret this to mean that individuals with characteristic $X_j = 1$ are twice as likely, on average, to stay in the service as those with $X_j = 0$. Such a change might have the effect of changing the odds of staying in from 1 to 1 ("even money") to 1 to 2 (representing a change in probability from 0.5 to 0.67), or it might change the odds of staying in from 100 to 1 to 50 to 1 (representing a change in probability from roughly 0.001 to 0.02). Because of the nonlinear relationship between the $\hat{p}_i$ and the $\hat{\beta}$, this model cannot measure the effect of changes in $\hat{\beta}$ directly on the values of $\hat{p}_i$.

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